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Buyer's Guide

Intel® Xeon™ Processor MP

**Can a processor be designed  
to deliver optimal business value  
for 4-way and greater servers?**

**Yes. The Intel® Xeon™ processor MP  
provides the performance, scalability  
and reliability for server consolidation  
and key enterprise applications.**



Powerful and cost-effective  
servers to run the broadest  
range of applications.



# Table of Contents

Introduction . . . . .	3
Innovative Server Technologies . . . . .	4
Intel® NetBurst™ Microarchitecture . . . . .	4
Hyper-Threading Technology . . . . .	5
Integrated Three-Level Cache Architecture . . . . .	6
Performance . . . . .	7
Scale Right. . . . .	8
Strategic Consolidation . . . . .	9
Maximizing Business Value. . . . .	11
Enterprise Application Characteristics . . . . .	12
Key Enterprise Applications . . . . .	14
Reliability . . . . .	15
For More Information . . . . .	16

# Introduction: Innovative Technologies

**Enhance Your Business Value** – Today's current enterprise and e-Business environments place tough demands on your servers. The challenge to provide an enhanced user experience, coupled with a multiplying number of users needing support, is tasking your servers to do more, and faster. To maximize efficiency, your servers must deliver a high throughput or response rate on multithreaded tasks and operations. You need a stable server solution that can maintain high demands for availability during peak workloads and still accommodate a variety of applications from data mining to evolving Web services.

While you are considering everything you need, you must also carefully balance the urgency of better technologies with the pressure of keeping costs down. You are looking at server consolidation opportunities. You understand the value of building your infrastructure on industry standards, so that when your business needs demand it, you can easily Scale Right (scale up and scale out). You want the ability to choose from multiple hardware and software vendors who can deliver industry-leading price/performance.

**Enhance Your Business Productivity** – Now is the ideal time to upgrade your existing multi-processor (MP) infrastructure. With the innovative technologies of Intel® NetBurst™ microarchitecture, Hyper-Threading Technology and the Integrated Three-Level cache architecture with 512KB of L2 cache and a large 2MB L3 cache, Intel® Xeon™ processor MP-based servers increase your business's competitive advantage by offering world-class performance for today's demanding server workloads. The Intel NetBurst microarchitecture provides the scalability and headroom needed for future business growth, stability for maximum uptime, and compatibility with today's industry-standard enterprise and e-Business solutions.

The Intel Xeon processor MP provides mid-to-high and back-end users with world-class performance for demanding enterprise applications, stability of proven solutions, unparalleled value and versatility to adapt to business needs.

*Platform enhancements in the mid-tier and back-end server segments make now the ideal time to upgrade your existing 2- to 4- way multi-processing infrastructure to a more powerful (4-way and up), Intel® Xeon™ processor MP-based infrastructure.*

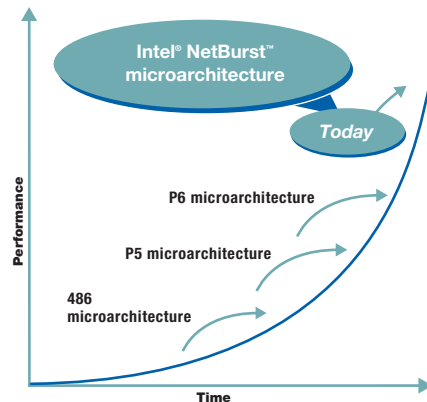
# Innovative Server Technologies

## Intel® NetBurst™ Microarchitecture:

### The foundation for the Intel® Xeon™ Processor MP and Intel® Pentium® 4 processor

The Intel® NetBurst™ microarchitecture offers several innovations that allow the Intel® Xeon™ processor MP to deliver industry-leading server performance. This microarchitecture features higher clock speeds (up to 2 GHz in the Intel Xeon processor MP), a 400 MHz system bus, a Rapid Execution Engine, and an Execution Trace Cache. These features are incorporated specifically to increase performance and throughput on your current applications and build headroom for Intel Xeon processor family-based server platforms to meet current and future performance needs as your business and workloads grow. Today's newest server operating systems, including Microsoft .NET\* Server family, have been optimized for the Intel NetBurst microarchitecture. Specific microarchitectural benefits include:

- **Higher clock speeds with future headroom:** faster raw execution providing higher transaction rates and faster response times
- **Rapid Execution Engine:** 2x clock speed for Arithmetic Logic Unit operations giving increased performance to compute servers
- **Execution Trace Cache:** improves performance by removing decoder latency and speeds up instruction throughput



# Innovative Server Technologies (continued)

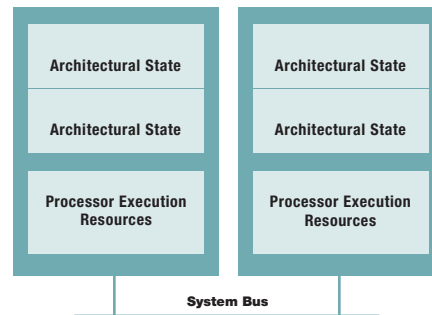
## Hyper-Threading Technology: Providing Immediate Performance Benefits for Today's Server Applications

Going beyond GHz (processor core frequency), Intel is changing the landscape of server processor design and performance by including simultaneous multithreading on a processor. Intel's groundbreaking Hyper-Threading Technology allows your multi-processing applications to execute more than one thread per processor, increasing the throughput of your server applications and enabling you to handle future workloads.

As the majority of server applications are multithreaded, servers with Hyper-Threading Technology-enabled processors deliver a strategic advantage. This technology provides immediate benefits for today's business applications by:

- Increasing the number of transactions that can be processed for the enterprise
- Enabling support for more enterprise productivity
- Providing faster users, improving response times for Web sites, e-Business and enterprise applications to enhance your customer's experience

**Dual Intel® Xeon™ Processor-based System with Hyper-Threading Technology**

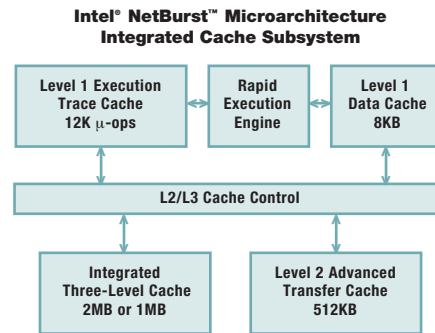


# Innovative Server Technologies (continued)

## Integrated Three-Level Cache Architecture (1MB or 2MB iL3)

With the Intel® Xeon™ processor MP, an additional third level of cache is introduced. The Integrated Three-Level cache architecture is located on-processor and designed to meet the compute needs of “cache hungry” high-end server applications – applications with frequent data access cycles. The new Execution Trace Cache (Level 1) provides fast access to decoded micro-op instructions, maximizing the Intel® NetBurst™ microarchitecture pipeline throughput. The Advanced Transfer Cache (Level 2), now doubled to 512KB, is tightly synchronized with the Level 1 cache and Rapid Execution Engine, improving access times for server data. Specifically designed for large server data sets, the Integrated Three-Level cache (2MB or 1MB) is coupled with the 400 MHz system bus to provide a high-bandwidth path to memory. The efficient design of the Integrated Three-Level cache provides a faster path to data stored in cache on the processor, resulting in increased throughput for larger workloads.

The winning combination of Intel NetBurst microarchitecture, Hyper-Threading Technology and the Integrated Three-Level cache architecture together results in increased performance, throughput and scalability for multi-processing server applications on Intel Xeon processor MP-based servers.

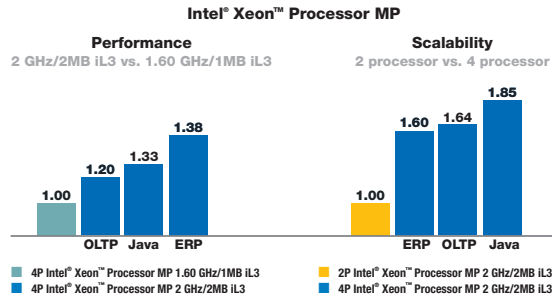


# Performance

## Providing the Capabilities to Accelerate Your Business

Intel® Xeon™ processor MP-based servers provide industry-leading compute power and throughput for e-Business and enterprise server applications including: Customer Relationship Management, Middleware, Collaboration, Media Servers, Site Management, Enterprise Databases, Business Intelligence and Supply Chain Management. The Intel Xeon processor MP provides outstanding throughput and headroom for large server workloads. At 2 GHz and 2MB iL3 cache, the Intel Xeon processor MP provides significant performance advantages, up to 38% over the Intel Xeon processor MP at 1.60 GHz with 1MB iL3 cache.

- **Support for more users:** Up to 38% more ERP users than 1.60 GHz Intel Xeon processor MP-based platforms
- **Increased transaction rates:** Up to 20% more online transactions processed than 1.60 GHz Intel® Xeon™ processor MP-based platforms, allowing headroom for peak workloads
- **Increased transaction rates:** Up to 33% more Java\* transactions processed than 1.60 GHz Intel® Xeon™ processor MP-based platforms, allowing headroom for peak workloads
- **Scalability:** Up to 85% more users supported (4-way compared to 2-way)



Source: Intel Corporation, September 2002

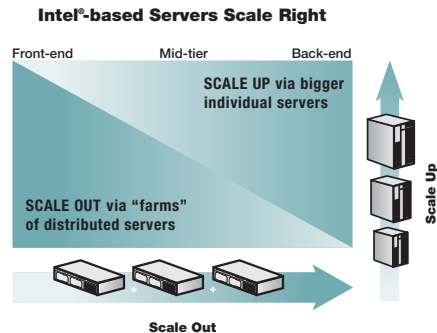
**System Configurations: OLTP Workload:** 1) Intel® Xeon™ Processor MP 2.00 GHz with 2MB L3 Cache - Model: Intel® SSH4 Server Beta System; BIOS: Build 53P; Processor: (4) Intel® Xeon™ Processors MP 2.00 GHz with 2MB cache; OS: Microsoft® Windows® 2000 Data Center; Memory: 24GB physical, (12 2GB DDR DIMMs); Disk Controllers: On board SCSI and (4) Qlogic® QLA 2300 series FibreChannel controllers; Disk Subsystem: (434) 18 GB, 15K RPM, Seagate® FiberChannel disk drives on 4 fibre loops, 32 EuroLogic® 2Gbit SANbloc FC2000 RAID controllers; Network Controller: (1) Intel® Pro1000XF Server Adapter; 2) Intel® Xeon™ Processor MP 1.60 GHz with 1MB L3 Cache; Processor: (4) Intel® Xeon™ Processors MP 1.60 GHz with 1MB Cache; Others same as above. **Java Workload:** 1) Intel® Xeon™ Processor MP 2.00 GHz with 2MB L3 Cache - Model: Intel SSH4 Server Beta System; BIOS: SSH40.86B.0044.B.0203061358 with Gallatin microcode update; Chipset: ServerWorks Grand Champion HE; Processor: (4) Intel® Xeon™ Processors MP 2.00 GHz with 2MB cache; Bus Speed: 400 MHz QDR; Memory: 4 GB; Network: Intel® 10/100; OS: Windows .Net® ES 3621; J7/JVM: JRockit® June 1447; 20020717; 2) Intel® Xeon™ Processor MP 1.60 GHz with 1MB L3 Cache - Model: Intel® SSH4 Server Beta System; BIOS: SSH40.86B.0044.B.0203061358; Chipset: ServerWorks® Grand Champion HE; Processor: (4) Intel® Xeon™ Processors MP 1.60 GHz with 1MB Cache; Bus Speed: 400 MHz QDR; Memory: 4 GB; Network: Intel® 10/100; OS: Windows .Net® ES 3621; J7/JVM: JRockit® June 1447; 20020717; **ERP Workload:** 1) Intel® Xeon™ Processor MP 2.00 GHz with 2MB L3 Cache - Model: Intel® SSH4 Server Beta System; BIOS: SSH40.86B.0053.B.0204181635 4/18/2002; Chipset: ServerWorks® CMIC-HE; Processor: (4) Intel® Xeon™ Processors MP 2.00 GHz with 2MB cache; Bus Speed: 400 MHz QDR; Memory: 4 GB (Eight 512K sticks); OS: Windows .NET® Enterprise Server 3628; DB: SQL Server® Enterprise 8.00.194; R3 Basis: 4.6D Nov 8th 2001 patch 880; P4-aware memory; Network card: Intel Corporation PRO/100(B) PCI Adapter; SCSI card: Adaptec 39160 Ultra160; Disk Layout: 1) OS: Seagate® Cheetah ST336752LC 36Gb 1500rpm 2) sap executables: same 3) DB disk (DB size=15G) same 4) Paging disk: same 2) Intel® Xeon™ Processor MP 1.60 GHz with 1MB L3 Cache - Processor: (4) Intel® Xeon™ Processors MP 1.60 GHz with 1MB Cache; Others same as above except disks are Seagate® 17G ST318405LC, All Benchmark runs > 98% CPU utilization over 7 minute high-load measurement period

# Scale Right

## Adding Capacity to Your Infrastructure in the Most Efficient and Effective Way Possible

As your business continues to grow and your technology needs continue to expand, it's time to investigate how your servers are functioning to support your needs. Are you supporting a number of platforms and servers? If you are, your IT resources are probably strained and your costs reflect the need for additional IT support. If you are performing the same tasks on different servers, that's another strain on your IT resources and your budget dollars.

The new Intel® Xeon™ processor MP allows you to Scale Right and optimize use of your server assets for maximum efficiency and effectiveness. Scaling Right means you choose the best combination of scaling out with additional smaller scale servers, and scaling up with additional processors in larger scale servers. For the mid-tier, where applications run, you might scale out with a cluster of 4- and 8-way Intel Xeon processor MP-based servers and have the option to scale up by adding additional processors to those servers – up to 32-way. Consolidate your servers by leveraging the headroom and scalability features of the platform to maximize your resources. By consolidating your servers, you can efficiently reduce overall operating costs, flexibly balance workloads across one or more systems, and Scale Right when your needs demand it.





# Strategic Consolidation

As your business grows, you are looking for the best return on your investments. A strong trend being seen today is that of consolidation. Consolidation is not just reducing the number of servers, however – it is about the reduction of both complexity and cost in your IT environments, and getting the best business value for your dollar. Consequently, we prefer to call it Strategic Consolidation, rather than Server Consolidation.

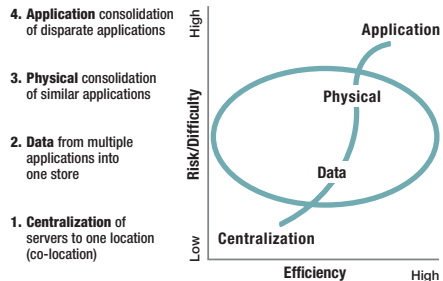
This trend is being driven in part by the advances in multi-processor Intel®-based platforms, thanks to the Intel® Xeon™ processor MP. Now, the value proposition which leads businesses to Intel® architecture is enhanced to offer great opportunities for consolidation.

Strategic consolidation is a four step program to be completed in order, to get the maximum return on your consolidation investments.

- **Centralization** of servers and data centers to one location
- **Data consolidation** from multiple applications into one store
- **Physical consolidation** of similar applications onto larger servers
- **Application Consolidation** of multiple applications onto larger servers

## Strategic Consolidation

A Risk/Reward Framework from Industry Analysts



Source: Meta Group,  
*Server Consolidation Platform Optimization*, 6/14/2000

## Strategic Consolidation (continued)

Note that Giga Group says approximately 90 percent of cost savings are prior to physical consolidation (see IdeaByte “Physical Server Consolidation: The Wrong Approach to Cost Savings,” David Friedlander, May 1, 2000). Meta Group, in the report *Server Consolidation Platform Optimization*, 6/14/2000, sees significant benefits from the first three steps.

Data consolidation using Intel® Xeon™ processor MP-based platforms offers you greater flexibility and agility. Physical consolidation on Intel Xeon processor MP-based platforms will reduce the number of servers you have, but more importantly, improve your utilization of resources.

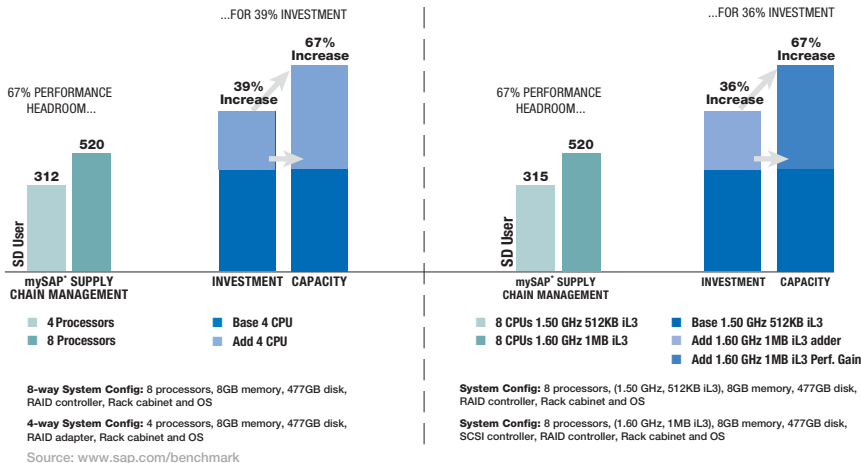


# Maximizing Business Value

It is important for you to achieve optimal business value, especially in these cost conscious times. A path to optimal business value is to ensure you get maximum return on your investment, which involves buying up at initial purchases to fully populated systems, or to large cache MP parts for intensive enterprise workloads.

Consolidation is a key trend and solution to both cost control and ease of management. To ensure you have the capacity required, consolidation projects should involve the best performing platforms available – with large cache to handle data-intensive workloads, and with the headroom to support new users. It also calls for purchasing fully populated 4- or 8-way servers out of the gate. The incremental cost of the additional processors is a fraction of the overall solution cost, and the additional performance and capacity deliver the best price/performance.

**Performance Scaling for MP-based Servers and Large Cache**  
Intel® Xeon™ Processor MP 8-way Servers: mySAP® Supply Chain Management R/3® 2-Tier SD User Benchmark



# Enterprise Application Characteristics

The Intel® Xeon™ processor MP has been designed exclusively for MP environments to support the demands of key enterprise applications. Features in the Intel Xeon processor MP match key enterprise application characteristics.<sup>1</sup>

Many applications execute in parallel operations, which makes great demands on the processor. Adding multiple processors improves solution performance. The Intel Xeon processor MP is specifically designed for multi-processor operation in 4P, 8P and up to 32P servers.

Multiple processors can be even more effective if the application is deliberately written to provide separate processor streams or threads that can be distributed across the processor set. On top of multiple processors, multithreaded applications will gain an additional performance boost if each of those processors features Hyper-Threading Technology. The Intel Xeon processor family is the only server processor with Hyper-Threading Technology.

For applications requiring very large data sets, the main memory in the system may be thought to be the cache for the local disk, which is the cache for the corporate database. When the complete data set can be held in local memory, the analysis will execute much faster. Servers built for the Intel Xeon processor MP typically have large memory support, up to 32GB or 64GB, or up to 8x that is supported in most dual-processor (DP)-based platforms.

*1. These characteristics are not mutually exclusive. Many applications exhibit some or all of these features. The list is not meant to be all-inclusive.*

## Enterprise Application Characteristics (continued)

Cache memory on the processor chip is faster than main memory. It allows frequently accessed data to be available to the processors with less waiting. Some cache helps nearly all applications, but many applications are cache hungry because they require frequent data access cycles. In these cases, larger caches, and more levels of cache, improve performance by reducing the time to fetch the data. The Intel Xeon processor MP features three levels of integrated cache, with a large third-level cache of 2MB.

It is important, therefore, to ensure that your architectural solution matches the characteristics of the applications you are running. For the majority of enterprise applications, servers with the Intel Xeon processor MP fit the bill.

Characteristic	Examples	Architectural Solution
Executes in parallel operations	<ul style="list-style-type: none"><li>• OLTP (short, independent operations)</li><li>• HPC (separate, perform, recombine)</li></ul>	Multiple Processors
Multithreading	JVM, Database, ERP	<ul style="list-style-type: none"><li>• Multiple Processors</li><li>• Hyper-Threading Technology</li></ul>
Large data sets	ERP, SCM, CRM	Large Memory Support
Frequent Data Access Cycles	CRM, SCM (Database search/sort)	Large, integrated cache

## Key Enterprise Applications

Application characteristics lead to certain dependencies for specific applications. Here you can see how several major enterprise applications have differing dependencies, and the Scale Right recommendation using the Intel® Xeon™ processor MP that best suits the need.

Application	Dependency	Scale Right Recommendation
BEA Weblogic*	Cache, Multithreading	4P, then scale out
i2 SCM Solution*	Processor	4P, then scale out
IBM DB2*	Processor, Cache, Memory	4P, 8P, 8P+ Maximum cache
IBM WebSphere*	Cache, Multithreading	4P, then scale out
Interwoven TeamSite*	Processor, Cache	4P, 8P
JD Edwards OneWorld*	Database Performance	4P, 8P
Oracle9i* RAC	Processor, Cache, Memory	4P (or 8P), then scale out
Pivotal eRelationship*	Processor, Cache	4P (app. Server), 8P (database)
SAP APO* Live Cache	Memory, Processor	4P, 8P, 8P+
SAP R/3 Basis*	Processor, Cache, Multithreading	4P, 8P, 8P+
SAS	Processor, Cache	4P, 8P, 8P+

# Reliability

## Ensuring Optimal Server Uptime

Intel® Xeon™ processor MP-based servers are designed to meet the most demanding uptime requirements at both the processor and platform levels.

### Processor-level features:

- Thermal sensors allow system to actively manage thermal conditions and reduce the chance of system failure
- Error Correction Code (ECC) on Integrated Three-Level cache architecture maintains the integrity of mission-critical data

### Platform-level features may include:

- System Management Bus (SMB) allows efficient communication between components and allows storage of system manageability information for ease of management
- Service Level Agreements available from a variety of server manufacturers
- Redundant and hot-swappable disks, power supplies and fans
- PCI hot-plug slots

- SMP support
- Platform health monitoring instrumentation
- Temperature and voltage monitoring
- Fan monitoring and control
- Serial redirection over LAN
- Emergency LAN-based management
- Automatic server restart
- OS Watchdog Timer
- Remote boot options via PXE
- Defined alerts: paging and LAN alerts (detect and alert)
- Error logs
- Field Replacement Unit (FRU) identification
- Telco alarm support

## For More Information

Contact your **Intel products representative** to discover how Intel® Xeon™ processor MP-based servers can enhance your business productivity.

Or, visit the Intel® Business Computing Web site at:  
[www.intel.com/eBusiness/products/server](http://www.intel.com/eBusiness/products/server)

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